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| **ART UNIT** | **PAPER NUMBER** |
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Please find below and/or attached an Office communication concerning this application or proceeding.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/618,500 | BLAICHER, CHRISTOPHER Y. | |
| | Examiner | Art Unit | |
| | Usmaan Saeed | 2166 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *11 July 2003*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-63* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-63* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☒ Claim(s) *64-69* are subject to restriction and/or election requirement.

**Application Papers**

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *11 July 2003* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

Group I. Claims 1-63, drawn to a method, instructions stored on program storage device, and a system for sorting an object, classified in class 707, subclass 7.

Group II. Claims 64-69, drawn to storage of a data structure, classified in class 707, subclass 101.

The inventions are distinct, each from the other because of the following reasons:

Inventions I and II are related as subcombinations disclosed as usable together in a single combination. The subcombinations are distinct from each other if they are shown to be separately usable. In the instant case, each of the respective inventions has a separate utility as in a system not having the others. See M.P.E.P. § 806.05(d).

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and the search required for group I is not required for the other groups, restriction for examination purposes as indicated is proper.

Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

Applicant is advised that the response to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed.

During a telephone conversation with Mr. Miles on 01/12/06 a provisional election was made without traverse to prosecute the invention of group I, claims 1-63. Affirmation of this election must be made by applicant in replying to this Office action. Claims 64-69 have been withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

***Drawings***

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference character(s) not mentioned in the

description: "Key Record-N 455". Corrected drawing sheets in compliance with 37 CFR 1.121(d), or amendment to the specification to add the reference character(s) in the description in compliance with 37 CFR 1.121(b) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they do not include the following reference sign(s) mentioned in the description: "Record-1 445 and key record-N 450". Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Specification***

3. The specification is objected to as failing to provide proper antecedent basis for the claimed subject matter. See 37 CFR 1.75(d)(1) and MPEP § 608.01(o). Correction of the following is required: Parameter list in claim 5 has not been mentioned in the description.

***Claim Rejections - 35 USC § 102***

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-2, 9-11, 16-17, 22-24, 27-28, 35-37, 40, and 50-52 are rejected under 35 U.S.C. 102(b) as being anticipated by **Applicants Admitted Prior Art** (**AAPA** hereinafter).

With respect to claim 1, **AAPA** teaches **a data sort method, comprising:**

**"obtaining a plurality of data records and, for each data record"** as an object typically includes one or more records (**AAPA** Paragraph 0002). Sort routine 100 reads and pads a record from the object being sorted (**AAPA** Paragraph 0003).

**"extracting key information**

**expanding the extracted key information"** as the act of padding converts variable length key fields to fixed length key fields of a size great enough to accommodate any value that the key may assume (**AAPA** Paragraph 0003). Therefore these lines teach us about getting the keys and then expanding them.

**"storing the expanded key information in a key record"** as once padded, the record is written to an intermediate file (block 110) (**AAPA** Paragraph 0003). The time required to write and read an intermediate file having expanded sort keys can consume a significant portion of the total time needed to sort the object (**AAPA** Paragraph 0003). The examiner interprets the key record as an intermediate file, which stores expanded sort keys.

**"sorting the plurality of key records based on the expanded key information"** as a sort utility is invoked that reorders and then stores the padded records in a result file (**AAPA** Paragraph 0003).

**"reorganizing the plurality of data records to correspond to the order of the sorted plurality of key records"** as one or more fields are designated as a sort key and that sorting reorders an object's records based on the value of the records' sort keys (**AAPA** Paragraph 0002). The object's records are being sorted based on the records' sort keys.

**"storing the reorganized plurality of data records without their associated expanded key information to a working storage"** as each sorted and padded record is then retrieved from the result file, unpadded and reloaded into the object (blocks 125,

130 and 135) (**AAPA** Paragraph 0003). The records in the object are storing the unpadded keys instead of padded/expanded key information.

Claims 16, 27 and 40 are same as claim 1 except claims 27 and 40 set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

Claims 22 and 24 contain the elements of claim 1 and are rejected for the same reasons as applied hereinabove.

With respect to claim 2, **AAPA** teaches, **"the method of claim 1, wherein the act of obtaining comprises obtaining data records from one or more storage devices"** as reading the object from external storage (**AAPA** paragraph 0002).

Claims 17, and 28 are same as claim 2 except claim 28 sets forth the claimed invention as a program storage device are rejected for the same reasons as applied hereinabove.

With respect to claim 9, **AAPA** teaches **"the method of claim 1, wherein the act of expanding comprises adjusting each key field to a fixed length"** as the act of padding converts variable length key fields to fixed length key fields of a size great enough to accommodate any value that the key may assume (**AAPA** Paragraph 0003).

Claims 35, and 50 are essentially the same as claim 9 except they set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 10, **AAPA** teaches **"the method of claim 1, wherein the act of storing the expanded key information in a key record further comprises, associating a value with each key record that identifies the data record from which the expanded key information was extracted"** as one or more fields are designated as a sort key and that sorting reorders an object's records based on the value of the records' sort keys (**AAPA** Paragraph 0002). The value of the records sort key is identifying the object/data records.

Claims 23, 36, and 51 are same as claim 10 except claims 36 and 51 set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 11, **AAPA** teaches **"the method of claim 10, wherein the act of storing the expanded key information in a key record does not comprise storing a data field from the data record associated with the key record"** as once padded, the record is written to an intermediate file (block 110) (**AAPA** Paragraph 0003). The time required to write and read an intermediate file having expanded sort keys can consume a significant portion of the total time needed to sort the object

(**AAPA** Paragraph 0003). Therefore the intermediate file has expanded sort keys, which are needed to sort the object/data records.

Claims 37, and 52 are essentially the same as claim 11 except they set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

***Claim Rejections - 35 USC § 103***

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 3-8, 12, 18-21, 29-34, and 41-49 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Applicants Admitted Prior Art** as applied to claims 1-2, 9-11, 16-17, 22-24, 27-28, 35-37, 40, and 50-52 above, in view of **Matsuda et al.** (**Matsuda** hereinafter) U.S. Patent No. 5,247,665.

With respect to claim 3, **AAPA** does not explicitly teach **"the method of claim 1, wherein the act of extracting comprises: determining a starting location for a first**

**key field; and calculating the starting location of a subsequent key field based on the determined starting location of the first key field."**

However, **Matsuda** discloses **"the method of claim 1, wherein the act of extracting comprises: determining a starting location for a first key field"** as adds the start location data (on the main memory 9) of the record in which the extracted key is stored to the key field Ki to for input data DI, and outputs the data DI to the RAPU 15. At this time, the controller 13 adds a flag indicating that the data is a key field Ki or an identifier Ai to the output data in synchronism with data output to the RAPU 15 (**Matsuda** Col 9, Lines 59-65). These lines teach the starting location of the data in which extracted key is stored and the flag indicates that the data is a key field. **"calculating the starting location of a subsequent key field based on the determined starting location of the first key field"** as in the key extraction processing, if the processing target file cannot be stored in the I-BUF at once, and hence mode for fetching the file in the I-BUF in units of elements of the file is set, every time key field extraction processing is completed for the element held in the I-BUF, the next element to be processed is fetched in the I-BUF. Such key field extraction processing is repeated until processing of the entire target file is completed (**Matsuda** Col 20, Lines 7-11). Each record length and each key field length are constant, the start location data (on the main memory 9) of each record can be obtained by multiplying the record length by the number of records (**Matsuda** Col 9, Lines 4-8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because

**Matsuda's** teaching would have allowed **AAPA** to efficiently execute sophisticated data processing for complex operations such as a sorting operation or a relational operation in an RDB with a simple control operation (**Matsuda** Col 1, Lines 63-66) by determining the starting location of the fields.

Claims 29, and 44 are essentially the same as claim 3 except they set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 4, **AAPA** does not explicitly teach **"the method of claim 3, wherein the act of determining comprises obtaining the starting location of the first key field from a sort control card."**

However, **Matsuda** discloses **"the method of claim 3, wherein the act of determining comprises obtaining the starting location of the first key field from a sort control card"** as the controller extracts a processing target key field Ki from each record of the processing target file stored in the first area of the main memory 9, and adds the start location data (on the main memory 9) of a record having the key field to the key field Ki as an identifier Ai. In this embodiment, since each record comprises a plurality of key fields, and each record length and each key field length are constant, the start location data (on the main memory 9) of each record can be obtained by multiplying the record length by the number of records (**Matsuda** Col 8, Lines 66-68 & Col 9, Lines 1-8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA** to efficiently execute sophisticated data processing for complex operations such as a sorting operation or a relational operation in an RDB with a simple control operation (**Matsuda** Col 1, Lines 63-66) by determining the starting location of the fields.

Claims 18, 30, and 45 are same as claim 4 except claims 30 and 45 set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 5, **AAPA** does not explicitly teach, **"the method of claim 4, wherein the sort control card comprises a parameter list."**

However, **Matsuda** discloses **"the method of claim 4, wherein the sort control card comprises a parameter list"** as the controller is constituted by, e.g., a 32-bit microprocessor 68020 available from MOTOROLA INC., U.S.A., and receives parameters from the CPU 1. The parameters include: data representing the position of a result identifier string stored in the second area of the main memory 9 (addresses in the second area of the main memory 9); logical data concerning a processing target file stored in the first area of the main memory 9 (file data such as a file format, a block length, and a record length); logical data concerning an output file (a file format, a block length, a record length, and the like); and physical data representing the storage

location of an output file (output file data such as a location on a disk and size) (**Matsuda** Col 10, Lines 52-62).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA** to rearranges the respective records in accordance with these parameters and thus forming an output file (**Matsuda** Col 10, Lines 63-68).

Claims 19, 31, and 46 are same as claim 5 except claims 31 and 46 set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 6, **AAPA** does not explicitly teach, **"the method of claim 4, wherein the sort control card identifies a starting position for each key field in a record relative to a first key field of the record."**

However, **Matsuda** discloses **"the method of claim 4, wherein the sort control card identifies a starting position for each key field in a record relative to a first key field of the record"** as the logical data of each of the processing target file and the output file include a file format, a block length, a record length, the respective key field positions and lengths of a multi-key field (**Matsuda** Col 12, Lines 10-14). Adding an identifier as a number or relative position data of each record to the key field, performing

an operation designated by the operation command using an obtained pair of the key field and the identifier as a processing unit (**Matsuda** Col 6, Lines 16-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA** to efficiently execute sophisticated data processing for complex operations such as a sorting operation or a relational operation in an RDB with a simple control operation (**Matsuda** Col 1, Lines 63-66) by determining the position of the key fields.

Claims 32, and 47 are essentially the same as claim 6 except they set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 7, **AAPA** does not explicitly teach, **"the method of claim 4, wherein the sort control card further indicates a data type for each key field in a record."**

However, **Matsuda** discloses **"the method of claim 4, wherein the sort control card further indicates a data type for each key field in a records"** as the controller is constituted by, e.g., a 32-bit microprocessor 68020 available from MOTOROLA INC., U.S.A., and receives parameters from the CPU 1. The parameters include: data representing the position of a result identifier string stored in the second area of the main memory 9 (addresses in the second area of the main memory 9); logical data

concerning a processing target file stored in the first area of the main memory 9 (file data such as a file format, a block length, and a record length); logical data concerning an output file (a file format, a block length, a record length, and the like); and physical data representing the storage location of an output file (output file data such as a location on a disk and size) (**Matsuda** Col 10, Lines 52-62). Examiner interprets the file format as data type.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA** to rearranges the respective records in accordance with these parameters and thus forming an output file (**Matsuda** Col 10, Lines 63-68) and data type being one of the parameters.

Claims 20, 33, and 48 are same as claim 7 except claims 33 and 48 set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 8, **AAPA** does not explicitly teach, **"the method of claim 7, wherein the sort control card further indicates a sort order for each key field in a record."**

However, **Matsuda** discloses **"the method of claim 7, wherein the sort control card further indicates a sort order for each key field in a record"** as upon reception

of an operation command for sorting (ascending order/descending order) or a relational operation from an input mechanism on a terminal side (**Matsuda** Col 9, Lines 35-37).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA** to efficiently execute sophisticated data processing for complex operations such as a sorting operation or a relational operation in an RDB with a simple control operation (**Matsuda** Col 1, Lines 63-66).

Claims 21, 34, and 49 are same as claim 8 except claims 34 and 49 set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 12, **AAPA** does not explicitly teach, **"The method of claim 1, wherein the working storage comprises one or more direct access storage devices."**

However, **Matsuda** discloses **"The method of claim 1, wherein the working storage comprises one or more direct access storage devices"** as in FIG. 5, a bus connection may be designed to allow the DBPU 27 to directly access a magnetic disk unit under the control of the CPU, so that a processing target file is stored in the local memory, and the start location data of a record having a designated key field in the local memory may be added to the corresponding key as an identifier (**Matsuda** Col 16,

Lines 62-68). External storage means for storing files comprising records having a plurality of data fields each assignable as a key field (**Matsuda** Col 2, Lines 5-7).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA** to efficiently execute sophisticated data processing for complex operations such as a sorting operation or a relational operation in an RDB with a simple control operation, and which can efficiently execute sophisticated arithmetic operations even if a target file is dispersed in a plurality of magnetic disk units connected to different input and output channel devices (**Matsuda** Col 1, Lines 63-67 & Col 2, Lines 1-2).

Claims 41, and 42 are essentially the same as claim 12 except they set forth the claimed invention as a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 43, **AAPA** does not explicitly teach **"the sorting system of claim 40, wherein the processing means comprises two or more communicatively coupled computer processors."**

However, **Matsuda** discloses **"the sorting system of claim 40, wherein the processing means comprises two or more communicatively coupled computer processors"** as the controller 13 is constituted by a microprocessor in this embodiment. For example, a 32-bit microprocessor 68020 available from MOTOROLA

INC., U.S.A., may be used as this microprocessor (**Matsuda** Col 8, Lines 58-61). The controller 21 is constituted by, e.g., a 32-bit microprocessor 68020 available from MOTOROLA INC., U.S.A., and receives parameters from the CPU 1 (**Matsuda** Col 10, 49-51).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA** to efficiently execute sophisticated data processing for complex operations such as a sorting operation or a relational operation in an RDB with a simple control operation (**Matsuda** Col 1, Lines 63-66).

6. Claims 13-15, 25-26, 38-39, 53-55, and 61-63 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Applicants Admitted Prior Art** as applied to claims 1-2, 9-11, 16-17, 22-24, 27-28, 35-37, 40, and 50-52 above, in view of **Ferguson et al.** (**Ferguson** hereinafter) U.S. Patent No. 5,274,805.

With respect to claim 13, **AAPA** does not explicitly disclose **"the method of claim 1, further comprising repeating the acts of obtaining, sorting, reorganizing and storing for at least a second plurality of data records."**

However, **Ferguson** discloses **"the method of claim 1, further comprising repeating the acts of obtaining, sorting, reorganizing and storing for at least a second plurality of data records"** as In terms of a tree structure, the substrings are

formatted as "leaf nodes", in that they comprise keys and pointers to records. To complete the upper levels of the tree structure, back to a root node, the logically sorted substrings are read in order from the storage system into memory, and a table of branch node key records is built up by reading key records from the substrings at node-sized intervals. A pointer to each such key record is determined and stored in the branch node table with the search key from the key record. When the branch node table is full, it is written out to the storage system, and a new branch node table is begun. The process is continued until all substrings are read. The process is then repeated, except that the first level of branch nodes are read from the storage system into memory and a second level of branch nodes are constructed. The process continues until a single root node is constructed (**Ferguson** Col 5, Lines 24-40).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Ferguson's** teaching would have allowed **AAPA** to sort key records first, and then build a tree based on keys extracted at intervals from sorted key records (**Ferguson** Col 3, Lines 2-4).

Claims 25, 38, and 53 are same as claim 13 except claims 38 and 53 set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 14, **AAPA** does not explicitly teach **"the method of claim 13, further comprising merging the two or more plurality of reorganized data records."**

However, **Ferguson** discloses **"the method of claim 13, further comprising merging the two or more plurality of reorganized data records"** as after the generation of all necessary strings, at least two strings at a time are read back into memory and then merged into sorted order (this example is of 2-way merging; it is known in the art to extend this concept to N-way merging). An example of this process is diagrammatically shown in FIG. 2. The merged string is then written out to the storage system. Such merging continues for subsequent passes until only a single, sorted string remains that contains all of the key records (**Ferguson** Col 3, Lines 18-27).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Ferguson's** teaching would have allowed **AAPA** to require fewer storage system access and hence is generally faster (**Ferguson** Col 5, Lines 42-45) by merging the reorganized data records.

Claims 26, 39, and 54 are same as claim 14 except claims 39 and 54 set forth the claimed invention as a program storage device and a system and are rejected for the same reasons as applied hereinabove.

With respect to claim 15, **AAPA** does not explicitly teach **"the method of claim 14, wherein the act of obtaining a plurality of data records comprises obtaining a plurality of DB2 data records and the act of merging further comprises reloading the merged plurality of reorganized data records into the DB2 data object."**

However, **Ferguson** discloses **"the method of claim 14, wherein the act of obtaining a plurality of data records comprises obtaining a plurality of DB2 data records and the act of merging further comprises reloading the merged plurality of reorganized data records into the DB2 data object"** as it should be noted that the sort was conducted entirely "in place" in that no working space was set aside on the storage system to temporarily store output data. All processed data is written back into the same storage system area from which the data was originally read. The inventive method therefore provides a way of sorting very large databases. This is very useful, for example, when sorting data on a storage system that has no excess storage space available (**Ferguson** Col 9, Lines 64-68 & Col 10, Lines 1-4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Ferguson's** teaching would have allowed **AAPA** to require fewer storage system access and hence is generally faster (**Ferguson** Col 5, Lines 42-45).

With respect to claim 55, **AAPA** teaches **"a data sort method, comprising:**

**"obtaining a plurality of data records from a database object, for each of the plurality of data records"** as an object typically includes one or more records

(**AAPA** Paragraph 0002). Sort routine 100 reads and pads a record from the object being sorted (**AAPA** Paragraph 0003).

**"extracting key information,**

**expanding the extracted key information"** as the act of padding converts variable length key fields to fixed length key fields of a size great enough to accommodate any value that the key may assume (**AAPA** Paragraph 0003). Therefore these lines teach us about getting the keys and then expanding them.

**"storing the expanded key information in a key record"** as once padded, the record is written to an intermediate file (block 110) (**AAPA** Paragraph 0003). The time required to write and read an intermediate file having expanded sort keys can consume a significant portion of the total time needed to sort the object (**AAPA** Paragraph 0003). The examiner interprets the key record as an intermediate file, which stores expanded sort keys.

**"sorting the plurality of key records based on the expanded key information"** as a sort utility is invoked that reorders and then stores the padded records in a result file (**AAPA** Paragraph 0003).

**"reorganizing the plurality of data records to correspond to the order of the sorted plurality of key records"** as one or more fields are designated as a sort key and that sorting reorders an object's records based on the value of the records' sort keys (**AAPA** Paragraph 0002). The object's records are being sorted based on the records' sort keys.

**"storing the reorganized plurality of data records without their associated expanded key information in a working storage"** as each sorted and padded record is then retrieved from the result file, unpadded and reloaded into the object (blocks 125, 130 and 135) (**AAPA** Paragraph 0003). The records in the object are storing the unpadded keys instead of padded/expanded key information.

**AAPA** discloses the elements of claim 55 as noted above but does not explicitly teach the steps of **"repeating the acts of obtaining, sorting, reorganizing and storing for at least a second plurality of data records"**

**"merging the at least two plurality of reorganized data records"**

**"re-loading the merged plurality of reorganized data records into the database object."**

However, **Ferguson** discloses, **"repeating the acts of obtaining, sorting, reorganizing and storing for at least a second plurality of data records"** as In terms of a tree structure, the substrings are formatted as "leaf nodes", in that they comprise keys and pointers to records. To complete the upper levels of the tree structure, back to a root node, the logically sorted substrings are read in order from the storage system into memory, and a table of branch node key records is built up by reading key records from the substrings at node-sized intervals. A pointer to each such key record is determined and stored in the branch node table with the search key from the key record. When the branch node table is full, it is written out to the storage system, and a new branch node table is begun. The process is continued until all substrings are read. The process is then repeated, except that the first level of branch

nodes are read from the storage system into memory and a second level of branch nodes are constructed. The process continues until a single root node is constructed (**Ferguson** Col 5, Lines 24-40).

**"merging the at least two plurality of reorganized data records"** as after the generation of all necessary strings, at least two strings at a time are read back into memory and then merged into sorted order (this example is of 2-way merging; it is known in the art to extend this concept to N-way merging). An example of this process is diagrammatically shown in FIG. 2. The merged string is then written out to the storage system. Such merging continues for subsequent passes until only a single, sorted string remains that contains all of the key records (**Ferguson** Col 3, Lines 18-27).

**"re-loading the merged plurality of reorganized data records into the database object"** as it should be noted that the sort was conducted entirely "in place" in that no working space was set aside on the storage system to temporarily store output data. All processed data is written back into the same storage system area from which the data was originally read. The inventive method therefore provides a way of sorting very large databases. This is very useful, for example, when sorting data on a storage system that has no excess storage space available (**Ferguson** Col 9, Lines 64-68 & Col 10, Lines 1-4).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Ferguson's** teaching would have allowed **AAPA** to require fewer storage system access and hence is generally faster (**Ferguson** Col 5, Lines 42-45) by merging the

reorganized data records and to sort key records first, and then build a tree based on keys extracted at intervals from sorted key records (**Ferguson** Col 3, Lines 2-4).

Claim 61 is same as claim 9 and is rejected for the same reasons as applied hereinabove.

Claim 62 is same as claim 10 and is rejected for the same reasons as applied hereinabove.

Claim 63 is same as claim 11 and is rejected for the same reasons as applied hereinabove.

7. Claims 56-60 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Applicants Admitted Prior Art** as applied to claims 1-2, 9-11, 16-17, 22-24, 27-28, 35-37, 40, and 50-52 above, in view of **Ferguson et al.** (U.S. Patent No. 5,274,805) as applied to claims 13-15, 25-26, 38-39, 53-55, and 61-63 above, further in view of **Matsuda et al.** (U.S. Patent No. 5,247,665).

With respect to claim 56, **AAPA and Ferguson** do not explicitly teach **"the data sort method of claim 55, wherein the act of extracting comprises obtaining the starting location of a first key field in a data record from a sort control card."**

However, **Matsuda** discloses **"the data sort method of claim 55, wherein the act of extracting comprises obtaining the starting location of a first key field in a**

**data record from a sort control card"** as the controller extracts a processing target key field Ki from each record of the processing target file stored in the first area of the main memory 9, and adds the start location data (on the main memory 9) of a record having the key field to the key field Ki as an identifier Ai. In this embodiment, since each record comprises a plurality of key fields, and each record length and each key field length are constant, the start location data (on the main memory 9) of each record can be obtained by multiplying the record length by the number of records (**Matsuda** Col 8, Lines 66-68 & Col 9, Lines 1-8).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA and Ferguson** to efficiently execute sophisticated data processing for complex operations such as a sorting operation or a relational operation in an RDB with a simple control operation (**Matsuda** Col 1, Lines 63-66) by determining the starting location of the fields.

With respect to claim 57, **AAPA and Ferguson** do not explicitly teach **"the data sort method of claim 56, wherein the sort control card identifies a starting position for each key field in a record relative to a first key field of the record."**

However, **Matsuda** discloses **"the data sort method of claim 56, wherein the sort control card identifies a starting position for each key field in a record relative to a first key field of the record"** as the logical data of each of the processing target file and the output file include a file format, a block length, a record length, the

respective key field positions and lengths of a multi-key field (**Matsuda** Col 12, Lines 10-14). Adding an identifier as a number or relative position data of each record to the key field, performing an operation designated by the operation command using an obtained pair of the key field and the identifier as a processing unit (**Matsuda** Col 6, Lines 16-20).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA and Ferguson** to efficiently execute sophisticated data processing for complex operations such as a sorting operation or a relational operation in an RDB with a simple control operation (**Matsuda** Col 1, Lines 63-66) by determining the position of the key fields.

With respect to claim 58, **AAPA and Ferguson** do not explicitly teach **"the data sort method of claim 56, wherein the sort control card further indicates a data type for each key field in a record."**

However, **Matsuda** discloses **"the data sort method of claim 56, wherein the sort control card further indicates a data type for each key field in a record"** as the controller is constituted by, e.g., a 32-bit microprocessor 68020 available from MOTOROLA INC., U.S.A., and receives parameters from the CPU 1. The parameters include: data representing the position of a result identifier string stored in the second area of the main memory 9 (addresses in the second area of the main memory 9); logical data concerning a processing target file stored in the first area of the main

memory 9 (file data such as a file format, a block length, and a record length); logical data concerning an output file (a file format, a block length, a record length, and the like); and physical data representing the storage location of an output file (output file data such as a location on a disk and size) (**Matsuda** Col 10, Lines 52-62). Examiner interprets the file format as data type.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA and Ferguson** to rearranges the respective records in accordance with these parameters and thus forming an output file (**Matsuda** Col 10, Lines 63-68) and data type being one of the parameters.

With respect to claim 59, **AAPA and Ferguson** do not explicitly teach **"the data sort method of claim 58, wherein the sort control card further indicates a sort order for each key field in a record."**

However, **Matsuda** discloses **"the data sort method of claim 58, wherein the sort control card further indicates a sort order for each key field in a record"** as upon reception of an operation command for sorting (ascending order/descending order) or a relational operation from an input mechanism on a terminal side (**Matsuda** Col 9, Lines 35-37).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA and Ferguson** to efficiently execute

sophisticated data processing for complex operations such as a sorting operation or a relational operation in an RDB with a simple control operation (**Matsuda** Col 1, Lines 63-66).

With respect to claim 60, **AAPA and Ferguson** do not explicitly teach, **"the data sort method of claim 58, wherein the sort control card comprises a parameter list."**

However, **Matsuda** discloses **"the data sort method of claim 58, wherein the sort control card comprises a parameter list"** as the controller is constituted by, e.g., a 32-bit microprocessor 68020 available from MOTOROLA INC., U.S.A., and receives parameters from the CPU 1. The parameters include: data representing the position of a result identifier string stored in the second area of the main memory 9 (addresses in the second area of the main memory 9); logical data concerning a processing target file stored in the first area of the main memory 9 (file data such as a file format, a block length, and a record length); logical data concerning an output file (a file format, a block length, a record length, and the like); and physical data representing the storage location of an output file (output file data such as a location on a disk and size) (**Matsuda** Col 10, Lines 52-62).

It would have been obvious to one of ordinary skill in the art at the time the invention was made to combine the teaching of the cited references because **Matsuda's** teaching would have allowed **AAPA and Ferguson** to rearranges the

respective records in accordance with these parameters and thus forming an output file (**Matsuda** Col 10, Lines 63-68).

***Conclusion***

8. The prior art made of record and not replied upon is considered pertinent to applicant's disclosure is listed on 892 form.

***Contact Information***

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Usmaan Saeed whose telephone number is (571)272-4046. The examiner can normally be reached on M-F 8-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hosain Alam can be reached on (571)272-3978. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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January 20, 2006

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